tion of births was not enforced in England until 1875, and it is probable that for many years later both birth and death registration were imperfect and irregular in Ireland, especially in its remote parts.

It would be more satisfactory, as supporting natural changes in fertility, if other trustworthy instances could be quoted. True, Dr. Brownlee's figures for Geneva are quoted showing a decline of more than 40 per cent. in the birth-rate between the beginning of the eighteenth century and the early nineteenth century; but these figures, like some other international rates for prolonged periods, can scarcely be said to favour the view that fluctuations in the birth-rate (corrected for number of marriages and age at marriage) occur naturally. If they do occur naturally we must assume that they are physiological in character, being rhythmic variations in "germinal vitality" (Brownlee), which have been compared to the outbursts of infectivity, say, in the influenza organism, the cause of which is unknown to us, though we express our ignorance by using Sydenham's language of "epidemic influences." Mr. Yule sees no reason "why man should be exempt from analogous phenomena," but it is difficult to conceive any analogy between variations in activity of unicellular organisms and variations in sexual activity of a complex mammalian. Nor are we impressed by the suggestion of comparability of such phenomena as plagues of field-mice or plagues of locusts. These are more naturally explained on the supposition that an excessive death-rate has occurred among other creatures which would have maintained the balance of Nature; and it does not appear inappropriate to refer to the old puzzle as to the relationship between old maids, field-mice, bees, and the clover crop.

This last suggestion brings us to the most valuable section of Mr. Yule's paper. Whether contraceptive measures or other causes, not being arithmetical as explained above, have caused the reduced birth-rate, how is the birth-rate related to economic conditions? Mr. Yule is convinced that the course of prices is closely related to the trend of the marriage-rate and of fertility, though he states that he is at a loss to suggest the precise nature of the nexus. He regards the nexus as economic, probably acting *via* psychology rather than directly through physiology; and he does not believe that the nexus is wholly volitional, acting through contraceptive measures or otherwise. He regards migration, marriage-rate, and fertility as only three forms of response to demand for population.

There we must leave this momentous problem. It deserves even more study than it has hitherto received. That economic circumstances, raising the age for gainful employment and the like, have had marked influence in lowering the birth-rate is certain. That the desire for a higher standard of comfort and for a more satisfactory upbringing of a smaller family, not necessarily selfish, has been a potent factor is equally without doubt. Whether at the end of another generation the differential birth-rate will, as many fear, lower the standard of health and intelligence is doubtful. The present writer regards this fear as exaggerated. Talent emerges in all social strata; but where large families imply imperfectly nourished children and a deficiency of parental care, they must necessarily lower the average standard of health. Is this occurring for a larger proportion of the total population than in previous generations? Probably not.

Indian Land Mollusca.

The Fauna of British India, including Ceylon and Burma: Mollusca.—III. *Land Operculates.* (*Cyclophoridae, Truncatellidae, Assimineidae, Helicinidae.*) By G. K. Gude. Pp. xiv + 386. (London: Taylor and Francis; Calcutta: Thacker, Spink, and Co.; Bombay: Thacker and Co., Ltd., 1921.) 35*s*.

AMONG the Indian land mollusca the family Cyclophoridæ especially attracts attention by the beauty of form and variety in the shells. The range is extensive, and their study began so far back as 1849, when W. H. Benson, of the Bengal Civil Service, and Capt. T. Hutton were writing on the animal of Diplommatina. After seventy years the above families are still very imperfectly understood, so little is known of the animal which constructs the shell. I think I am correct in saying the time had not arrived for publishing a volume on these molluscs, for sufficient material had not been examined; in truth, much has yet to be collected. It would be interesting to know for this reason why Mr. Gude was selected to do it, and the work then left to all intents and purposes completely in his hands; why malacologists with knowledge of the subject were not consulted; and why the present writer, with more than forty years' connection with these land operculates, both in the field and in collections, was in complete ignorance that such a work was under compilation. It leads me to think of past workers in this field of natural history. The foremost among them was the late Dr. William Blanford, the editor and founder of "The Fauna of British India." No one would have known better how much preliminary work there was to do, or what material to obtain; and had he lived he would have prepared the way for it, as he did for vol. 1 of the Mollusca Series (the Testacellidæ and Zonitidæ). It recalls the type of paper he wrote on the animals of Raphaulus, Spiraculum, and other tube-bearing Cyclostomacea so long ago as 1863 in "The Annals and Magazine of Natural History." There is even now food for thought in this paper, while it is an indication of how the history of the land operculates should be approached, which is to be looked for in vain in the publication under notice.

The shells of living species should no longer be treated as if they were fossils, the animal unobservable, unobtainable; this I notice under the genera Japonia, Cyclophorus, Alycœus, and Diplommatina, pp. 6, 57, 301, 304, and 349. This neglect of the animal in classification should not thus continue. It is not up to the standard of the present day, and some advance was to be looked for, based on more recent original investigation.

Space does not admit of quoting many and various errors, but looking at the contents I begin with "The Systematic Index" and naturally turn to the genera I am best acquainted with. On p. xii I have to notice, very fully, an unfortunate, inaccurate record of species under the sub-genus Raptomphalus of Alycœus; eight species are put into it, whereas it is represented by only one, *R. magnificus,* described by me in "Land and Freshwater Mollusca of India," vol. 2, part 12, p. 366, plate 156, figs. 1, *1a, 1b*. These figures show that in shell character it is very different and distinct from typical species of Alycœus. As yet it has been found only in the Yamne Valley, a large tributary of the Tsangpo, which comes in on the left bank, not far from the base of the mountains, in the Abor country.

Mr. Gude has extended the range of this new sub-genus enormously. One of the eight is a species from the Shan-Siam frontier, 500 miles distant, where the sub-genus cannot certainly be expected to extend. All these eight Alycœi are very variable in form, unlike *R. magnificus.* A glance at the figures will show this. A place for each of them has now to be found in the index, and all on pp. 286, 287, 288, and 289 are out of place. On p. 285 *Raptomphalus magnificus* is not the "first species"; it should be "only species."

Such a record does not help zoology; it has gone forth to the world, striking directly at the accuracy of geographical distribution, and before it can be disproved it will be used, trusted, and quoted by workers, both at home and abroad, for years to come. The record in "The Mollusca of India" from the first has been geographical. I have been at pains to show how the distribution of species living in the great valleys of the Himalayan range changes as we proceed from west to east. This was to be expected, for these great valleys are geologically ancient, isolated one from the other, and separated by great physical features, especially in the Eastern Himalaya by snow-clad meridional ridges. In age these valleys are sufficiently old to be centres of "species development." We are able to state that there is scarcely a species living in the Teesta Valley of Sikkim common to the Tsangpo Valley and Abor Hills. The molluscan fauna of the Dafla Hills is remarkable in comparison with both the above areas. Here physical geography comes in to the support of distribution, and shows how accurate the record of the latter should be made. The former tells us that while the Teesta Valley and its neighbours on the west in Nipal, and on the east in Bhutan, have drained for ages into the great depression of the Bay of Bengal, it was comparatively a recent geological change when the Brahmaputra took the same course. Indeed, all evidence goes to show that the Tsangpo originally drained into Burma; it certainly did so all through the Siwalik period, to go no further back in time. It was the elevation of the Assam range, extending from Eastern Assam to the Garo Hills, which produced this wonderful change in geography over a vast area. In Eastern Assam the Tertiary sandstones, all derived from the waste of the Himalayas, are elevated to 10,000 ft. and above. This has had everything to say to the distribution of life, particularly the molluscan, both land and freshwater, in this part of India and the eastern frontier, and affected the spread of genera and species. It explains why the molluscan fauna of the Tsangpo Valley is so restricted, and why it cannot be found anywhere, as the distribution attributed to Raptomphalus might lead some zoologists to suppose.

On geological evidence we can presume to say that the Barowli, the Dikrang, and the Ranga of the Eastern Himalaya once flowed directly to the Kyandwen, and the Subansiri and the Tsangpo to the Hkampti Long and head waters of the Irrawady. It explains the finding of certain species of Unio and Sphærium, both in Munipur and in Assam, and of the distribution of many other genera and species, including Austenia.

The volume adds very little to our previous knowledge of the land operculates of India. An opportunity has been lost of bringing that knowledge up to date. The money spent on it might have had a better result. There is an absence of editorial supervision. Mr. Guy A. K. Marshall is not mentioned in the preface; all seemingly devolved on Mr. G. K. Gude. It is purely conchological and was brought out in a hurry. It should not, in fact, have been commenced until it was first ascertained who were to be engaged upon it and what collections were available. This is most important to those who, at great expense of time and toil, collect material and desire to see it in the hands of the best malacologists and so far have a voice in the publication.

Next we have to consider the best place of publication, whether in this country or in India. I lean to the latter, for in India the animals of many genera could be collected in a few weeks as required and worked out by the staff of the Indian Museum, who are quite capable of doing so. I also consider it essential to accuracy in a record of this kind that the type shell of all species should be compared so far as possible to verify the "original descriptions" in the pages and pages of "copy" which fill the volume. This applies also to the figures given of species in the Natural History Museum and other collections. They are not typical; some have no history, and are not in all cases correctly identified.

The history of the Indian operculate land shells has yet to be compiled and a more scientific classification built up. For this reason I am disappointed with this volume of "The Fauna of British India," and imagine that among other zoologists there will be a similar feeling.

In the volume there is a mass of useful compilation, particularly in the synonymy, as well as in the bringing together of the many species in the four families treated of. This work, looked at from the purely conchological side, cannot fail to be useful to collectors.

H. H. GODWIN-AUSTEN.

Chemistry of Anthracene.

Anthracene and Anthraquinone. By E. de B. Barnett. Pp. xi+436. (London: Baillière, Tindall, and Cox, 1921.) 27*s.* 6*d.*

THE history of anthracene is long and vivid. Discovered amongst the products of coal-tar distillation in 1832, the hydrocarbon played a modest and somewhat commonplace part in the development of structural theory, suddenly blossoming into prominence in 1868, when it was found that alizarin, the twin monarch with indigo of natural colouring matters, is a dihydroxyanthraquinone. The persistent and active investigation of anthracene derivatives consequent on this revelation had scarcely slackened in 1901, when Bohn discovered the remarkable condensation undergone by β-aminoanthraquinone, leading to indanthrene and flavanthrene, vat-dyes superior in fastness to indigo itself. During the subsequent period notable additions to the series have been made in the direction of complex benzanthrones—for example, violanthrene, a non-nitrogenous vat-dye represented as an oxygenated agglomeration of nine benzenoid nuclei. Thus anthracene, now approaching its centenary still provides abundant material for scientific investigation and practical application.

It is, therefore, most appropriate that so much information, extending over so many years, should be assembled in a form convenient for reference, and the volume which Mr. Barnett has produced will be found extremely valuable by all chemists who desire to be advised of the latest discoveries in this important field. Beginning with a comprehensive survey of the early work and the substituted derivatives of anthracene itself, the author passes to anthraquinone, anthrone, and anthranol. Treatment of the numerous hydroxyanthraquinones has been limited to the ground which is not covered by A. G. Perkin and Everest in their recent book on "The Natural Organic Colouring Matters," and thus it has been possible to devote almost half the text to aminoanthraquinones and the highly important modern discoveries to which reference has been made. It is this feature which will be most appreciated by chemists because, owing to the recent developments of anthracene chemistry having taken place principally in the German dye-factories, the relevant information is largely scattered through the patent literature, and is consequently not easy of access.

Some idea of the faithful industry which the author has brought to his task may be gained from the statement that the index to German patents so liberally quoted throughout the volume alone occupies eighteen pages, and refers to more than one thousand items, which are assembled in sequence, with the respective date and name of patentee. Constant attention is directed to those colouring matters which arise from the various classes of anthracene derivatives, thus adding to the general usefulness of the book a quality speci-